Fall 2019

MATH 371-001: Physiology and Medicine

Bruce Bukiet

NJIT New Jersey's Science & Technology University

THE COLLEGE OF SCIENCE AND LIBERAL ARTS

THE DEPARTMENT OF MATHEMATICAL SCIENCES

MATH 371: Physiology and Medicine
Fall 2019 Course Syllabus

NJIT Academic Integrity Code: All Students should be aware that the Department of Mathematical Sciences takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

COURSE INFORMATION

Course Description: Mathematical models of organs and organ systems: the heart and circulation, gas exchange in the lungs, electrical properties of excitable membranes, neuro-biological clocks, the renal countercurrent mechanism, muscle mechanics. The biology is introduced with each topic. Emphasis is on quantitative problem solving, model building, and numerical simulation.

Number of Credits: 3

Prerequisites: MATH 222 with a grade of C or better.

Course-Section and Instructors

Course-Section	Instructor
Math 371-001	Professor B. Bukiet Website: https://web.njit.edu/~bukiet/

Office Hours for All Math Instructors: Fall 2019 Office Hours and Emails

Required Textbook:

Title	*Modeling and Simulation in Medicine and the Life Sciences*
Author	Hoppensteadt and Peskin
Edition	2nd
Publisher	Springer
ISBN #	978-0387950723

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, November 11, 2019**. It will be strictly enforced.

COURSE GOALS

Learning Outcomes

Students succeeding in this course will be abe to:

- Use biological and physiological information to develop mathematical representations of physiological processes
- Use mathematical/computational techniques to analyze mathematical models of physiological processes
- Investigate and communicate the implications (advantages and disadvantages) of the mathematical representation and the connections to the model's development and the physiology it represents
- Elucidate the implications of including terms / aspects of physiology or excluding terms / physiology in a mathematical model of physiology
- Elucidate the implications of including terms / aspects of physiology or excluding terms / physiology in a mathematical model of physiology
- Develop their mathematics, logical thinking and problem-solving skills in the context of mathematical physiology topics

Course Assessment: The assessment of objectives will be achieved through homework, examinations and through a project.

POLICIES

DMS Course Policies: All DMS students must familiarize themselves with, and adhere to, the Department of Mathematical Sciences Course Policies, in addition to official university-wide policies. DMS takes these policies very seriously and enforces them strictly.

Grading Policy: The final grade in this course will be determined as follows:

Homework and Class Participation	20%
Midterm Exam	25%
Final Exam	35%
Project	20%

Your final letter grade will be based on the following tentative curve.

A	90 - 100	**D**	60 - 69
B+	86 - 89	**F**	0 - 59
B	80 - 85		
C+	76 - 79		

Attendance Policy: Attendance at all classes will be recorded and is **mandatory**. Please make sure you read and fully understand the Math Department's Attendance Policy. This policy will be strictly enforced.

Homework Policy: There will be weekly homework assignments which will be corrected and graded. As part of your homework grade will be the required attendance of at least one research seminar with mathematical and biology content (Math Colloquium, Mathematical Biology Seminar, Biology Colloquium, BME Seminar) with a two page description of the topic and the presentation.

Project: There will be one research project due toward the end of the semester. This project can be chosen from many that are listed in the textbook or can be something you independently come up with and discuss with the professor. Preliminary choice of topic should be discussed with the professor no later than November 1. The project report should be in the form of a research paper and should be 10-15 pages long including any figures, and references. More details will be provided in class.

COURSE POLICIES:

- Homework assignments may require use of MATLAB software.
- Tutors are available in accordance with the Math department's posted schedule.

Exams: There will be one midterm exam held in class during the semester and one comprehensive final exam. Exams are held on the following days:

Midterm Exam	October 28, 2019
Final Exam Period	December 14 - 20, 2019

The final exam will test your knowledge of all the course material taught in the entire course. Make sure you read and fully understand the Math Department's Examination Policy. This policy will be strictly enforced.

Makeup Exam Policy: There will be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event an exam is not taken under rare circumstances where the student has a legitimate reason for missing the exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the Math Department Office/Instructor that the exam will be missed.

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times.

ADDITIONAL RESOURCES

Math Tutoring Center: Located in Cullimore, Room 214 (See: Fall 2017 Hours)

Further Assistance: For further questions, students should contact their instructor. All instructors have regular office hours during the week. These office hours are listed on the Math Department's webpage for Instructor Office Hours and Emails.

All students must familiarize themselves with and adhere to the Department of Mathematical Sciences Course Policies, in addition to official university-wide policies. The Department of Mathematical Sciences takes these policies very seriously and enforces them strictly.

Accommodation of Disabilities: Disability Support Services (DSS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please contact Chantonette Lyles, Associate Director of Disability Support Services at 973-596-5417 or via email at lyles@njit.edu. The office is located in Fenster Hall Room 260. A Letter of Accommodation Eligibility from the Disability Support Services office authorizing your accommodations will be required.

For further information regarding self identification, the submission of medical documentation and additional support services provided please visit the Disability Support Services (DSS) website at:

- https://www.njit.edu/studentsuccess/accessibility/

Important Dates (See: Fall 2019 Academic Calendar, Registrar)

Date	Day	Event
September 3, 2019	T	First Day of Classes
September 13, 2019	F	Last Day to Add/Drop Classes
November 11, 2019	M	Last Day to Withdraw

November 26, 2019	T	Thursday Classes Meet
November 27, 2019	W	Friday Classes Meet
November 28-29, 2019	R-F	Thanksgiving Recess
December 11, 2019	W	Last Day of Classes
December 12, 13 2019	R & F	Reading Days
December 14-20, 2019	F - R	Final Exam Period

Course Outline

Tentative Course Outline

Date	Lecture	Sections	Topic
9/5	1	*	Introduction to the Course: Glucose uptake and diabetes
9/9	2	*	Glucose uptake and diabetes
9/12	3	*	Glucose uptake and diabetes
9/16	4	*	Glucose uptake and diabetes
9/19	5	1.1-1.4	Heart and Circulation
9/23	6	1.5	Heart and Circulation
9/26	7	1.6-1.7	Heart and Circulation
9/30	8		Guest Lecture or Online work
10/3	9	1.8	Heart and Circulation
10/7	10	1.9	Heart and Circulation
10/10	11	1.1	Heart and Circulation
10/14	12		Guest Lecture or Online work
10/17	13	1.11	Heart and Circulation
10/21	14		Guest Lecture or Online work
10/24	15		Review
10/28	16		Midterm Exam
10/31	17	2.1-2.2	Gas Exchange in the Lungs
11/4	18	2.3-2.5	Gas Exchange in the Lungs
11/7	19	2.6	Gas Exchange in the Lungs
11/11	20	3.1	Cell Volume and Electrical Properties
11/14	21	3.2-3.3	Cell Volume and Electrical Properties
11/18	22	3.4-3.5	Cell Volume and Electrical Properties
11/21	23	*	Ovarian Folliculation
11/25	24	*	Ovarian Folliculation
11/26	25		Project presentations
12/2	26		Project presentations

12/5	27		Project presentations
12/9	28		Review
12/14-12/20			FINAL EXAM WEEK
*			Resource provided on course webpage